FIG.1

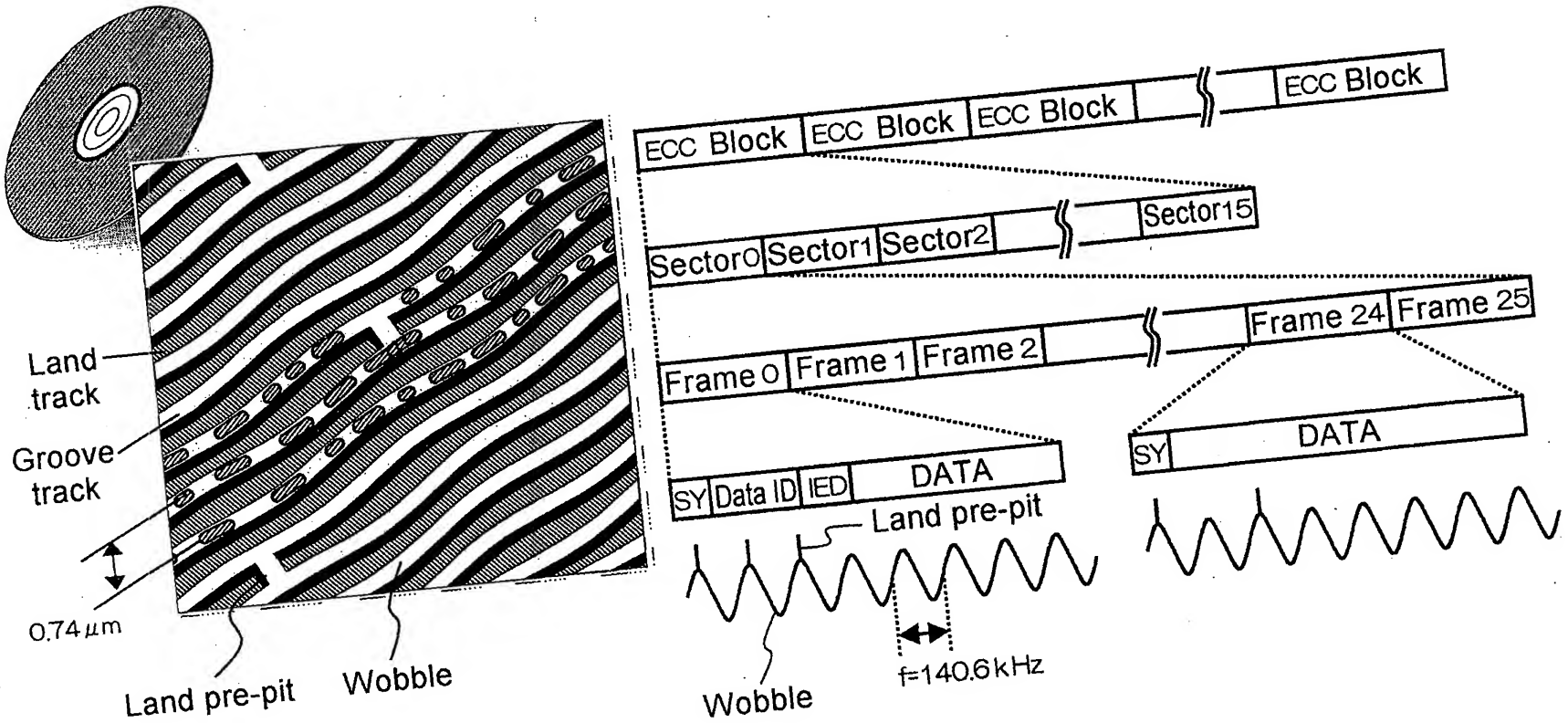

Land track
Groove track
0.74 μm
Land pre-pit
Wobble
ECC Block
ECC Block
ECC Block
ECC Block
Sector0
Sector1
Sector2
Sector15
Frame 0
Frame 1
Frame 2
Frame 24
Frame 25
SY
Data ID
IED
DATA
SY
DATA
Land pre-pit
Wobble
f=140.6 kHz

FIG.2

bit2	bit1	bit0	Meaning
1	1	1	EVEN sync
1	1	0	ODD sync
1	0	1	Data "1"
1	0	0	Data "0"

FIG.3

	bit0	bit1-4	bit5-12	
	SYNC	RA	DATA	
0		0000b	1st byte of ECC Block address	PartA
1		0001b	2st byte of ECC Block address	
2		0010b	3st byte of ECC Block address	
3		0011b	1st byte of Parity A	
4		0100b	2st byte of Parity A	
5		0101b	3st byte of Parity A	
6		0110b	Field ID(00h)	PartB
7		0111b	1st byte of ECC Block address	
8		1000b	2st byte of ECC Block address	
9		1001b	3st byte of ECC Block address	
10		1010b	reserved	
11		1011b	reserved	
12		1100b	reserved	
13		1101b	1st byte of Parity B	
14		1110b	2st byte of Parity B	
15		1111b	3st byte of Parity B	

FIG.4

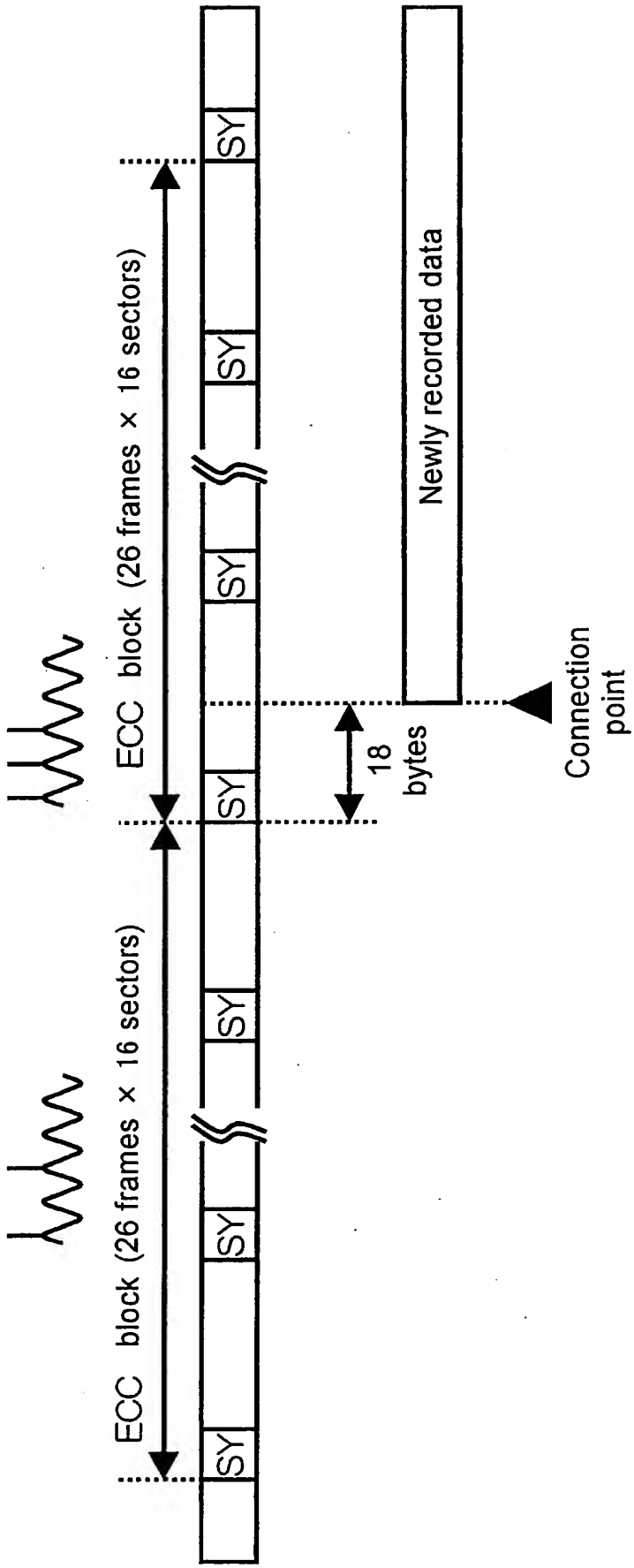

ECC block (26 frames × 16 sectors)
ECC block (26 frames × 16 sectors)
SY
SY
SY
SY
SY
18 bytes
Newly recorded data
Connection point

FIG.5A

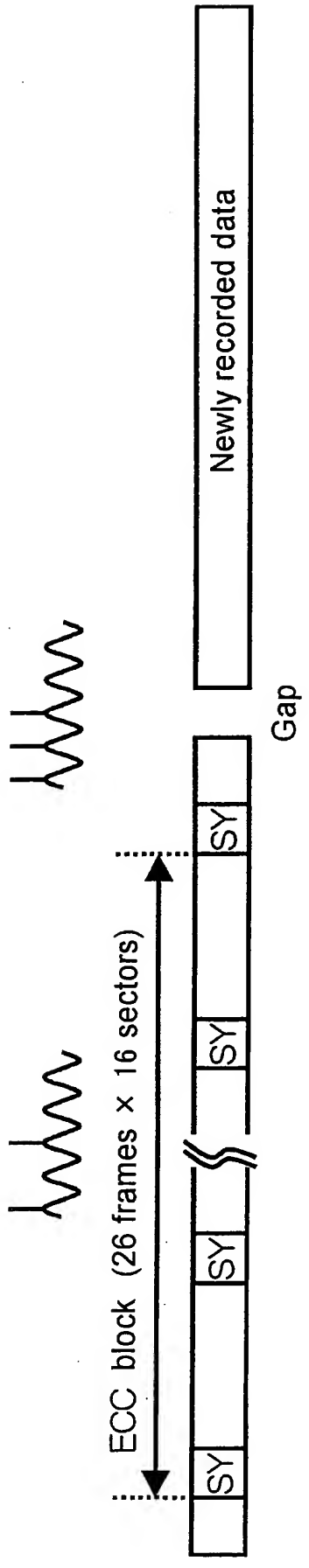

Newly recorded data
Gap
SY
SY
SY
SY
ECC block (26 frames × 16 sectors)

FIG.5B

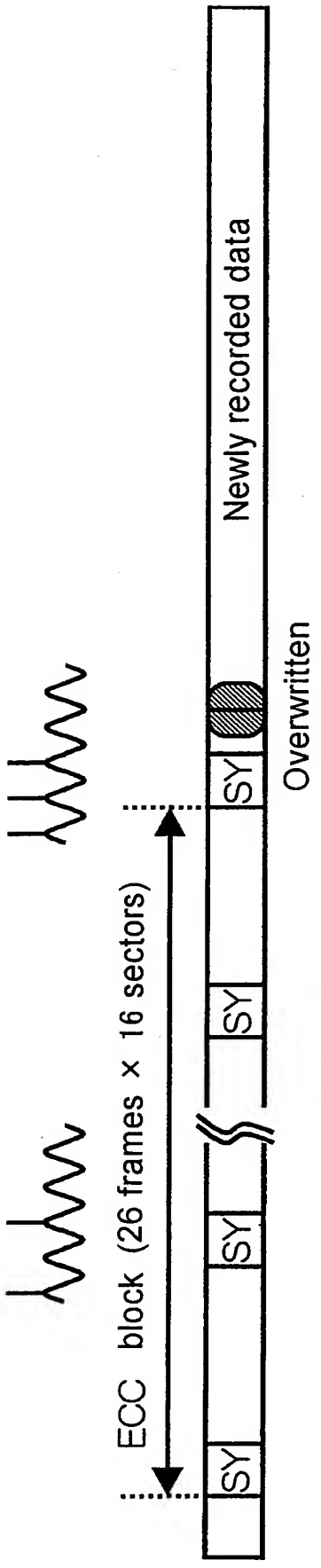
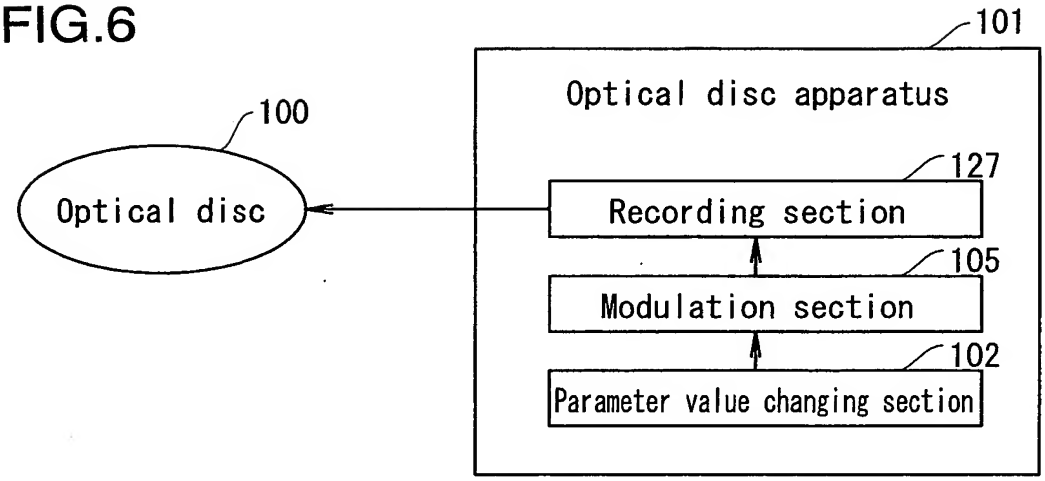

ECC block (26 frames × 16 sectors)
SY
SY
SY
SY
Newly recorded data
Overwritten

FIG.6


101
Optical disc apparatus
100
Optical disc
127
Recording section
105
Modulation section
102
Parameter value changing section

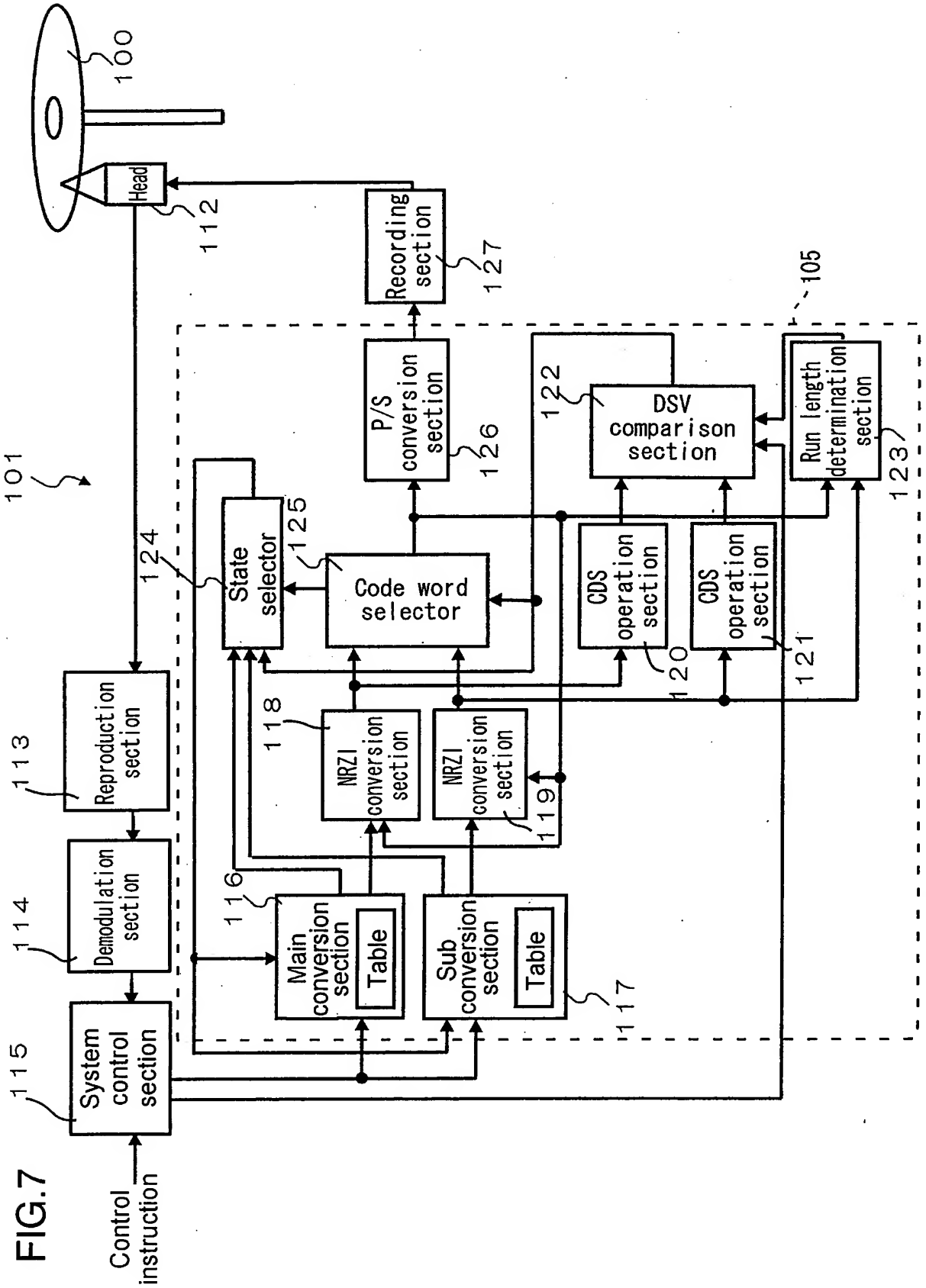

100
Head
112
Recording section
127
105
101
P/S conversion section
126
122
DSV comparison section
Run length determination section
123
124
State selector
125
Code word selector
CDS operation section
120
CDS operation section
121
Reproduction section
113
118
NRZI conversion section
NRZI conversion section
119
Demodulation section
114
116
Main conversion section
Table
Sub conversion section
Table
117
System control section
115
Control instruction

FIG.7

FIG.8

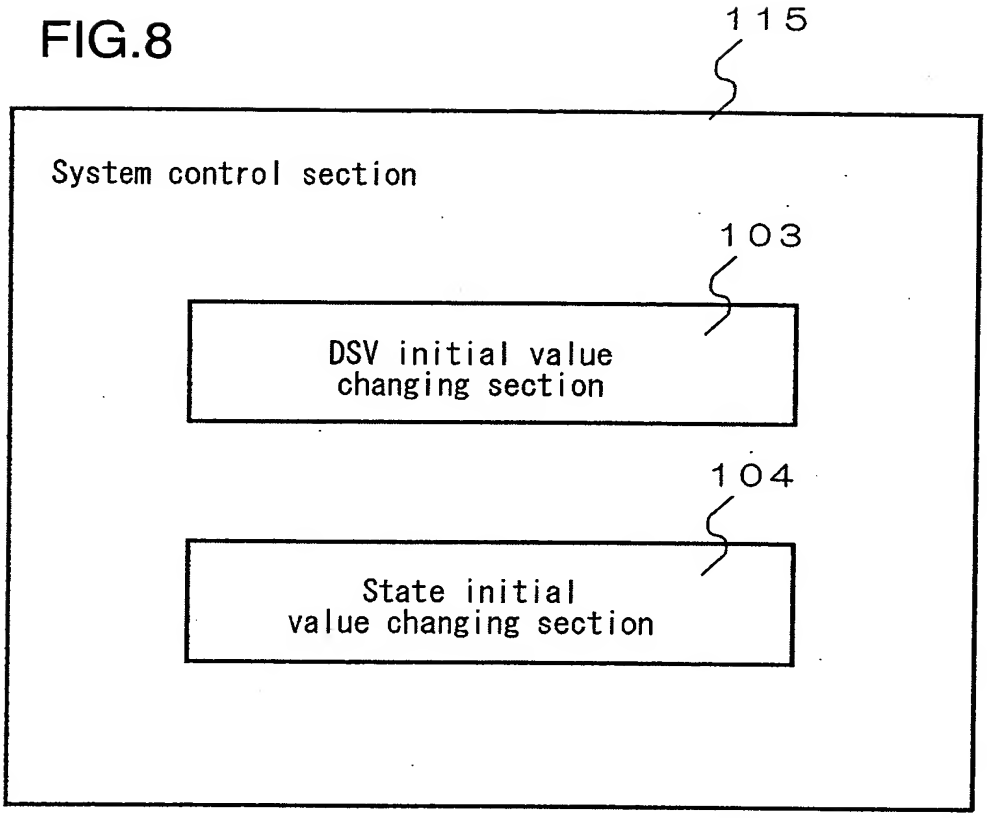

115
System control section
103
DSV initial value changing section
104
State initial value changing section

FIG.9A

Main conversion table (data section)

Data symbol	State 1		State 2		State 3		State 4	
	Code word	Next state	Code word	Next state	Code word	Next state	Code word	Next state
0	0010000000001001	1	0100000100100000	2	0010000000001001	1	0100000100100000	2
1	0010000000010010	1	0010000000010010	1	1000000100100000	3	1000000100100000	3
2	0010000100100000	2	0010000100100000	2	1000000000010010	1	1000000000010010	1

FIG.9B

Sub conversion table (data section)

Data symbol	State 1		State 2		State 3		State 4	
	Code word	Next state	Code word	Next state	Code word	Next state	Code word	Next state
0	0000010010000000	4	0000010010000000	4	0100100001001000	2	0100100001001000	2
1	0000100100000000	4	0000100100000000	4	0100100001001000	3	0100100001001000	3
2	0001001000000000	4	0001001000000000	4	0100100000001001	1	0100100000001001	1

▲ State information bit

FIG.10A

Frame number	Sync number
1	SY0
2	SY5
3	SY1
4	SY5
5	SY2
6	SY5
7	SY3
8	SY5
9	SY4
10	SY5
11	SY1
12	SY6
13	SY2
14	SY6
15	SY3
16	SY6
17	SY4
18	SY6
19	SY1
20	SY7
21	SY2
22	SY7
23	SY3
24	SY7
25	SY4
26	SY7

FIG.10B

Main conversion table (sync section)

Sync number	State 1 / State 2	State 3 / State 4
	Sync code	Sync code
SY0	00010010010001000000000000010001	10010010000001000000000000010001
SY1	00000100000001000000000000010001	10000100010001000000000000010001
SY2	00010000000001000000000000010001	10010000100001000000000000010001
SY3	00001000000001000000000000010001	10000010010001000000000000010001
SY4	00100000000001000000000000010001	10001000010001000000000000010001
SY5	00100010010001000000000000010001	10001001000001000000000000010001
SY6	00100100100001000000000000010001	10010000100001000000000000010001
SY7	00100100010001000000000000010001	10001000100001000000000000010001

FIG.10C

Sub conversion table (sync section)

Sync number	State 1 /state 2	State 3 /state 4
	Sync code	Sync code
SY0	000100100000010000000000000010001	100100100100010000000000000010001
SY1	000001000100010000000000000010001	100001000000010000000000000010001
SY2	000100000100010000000000000010001	100100000000010000000000000010001
SY3	000010000100010000000000000010001	100000100000010000000000000010001
SY4	000100000100010000000000000010001	100010000000010000000000000010001
SY5	000100010000010000000000000010001	100000010000010000000000000010001
SY6	000100000100010000000000000010001	100000000100010000000000000010001
SY7	000100100000010000000000000010001	100000001000010000000000000010001

▲ State information bit

FIG.11

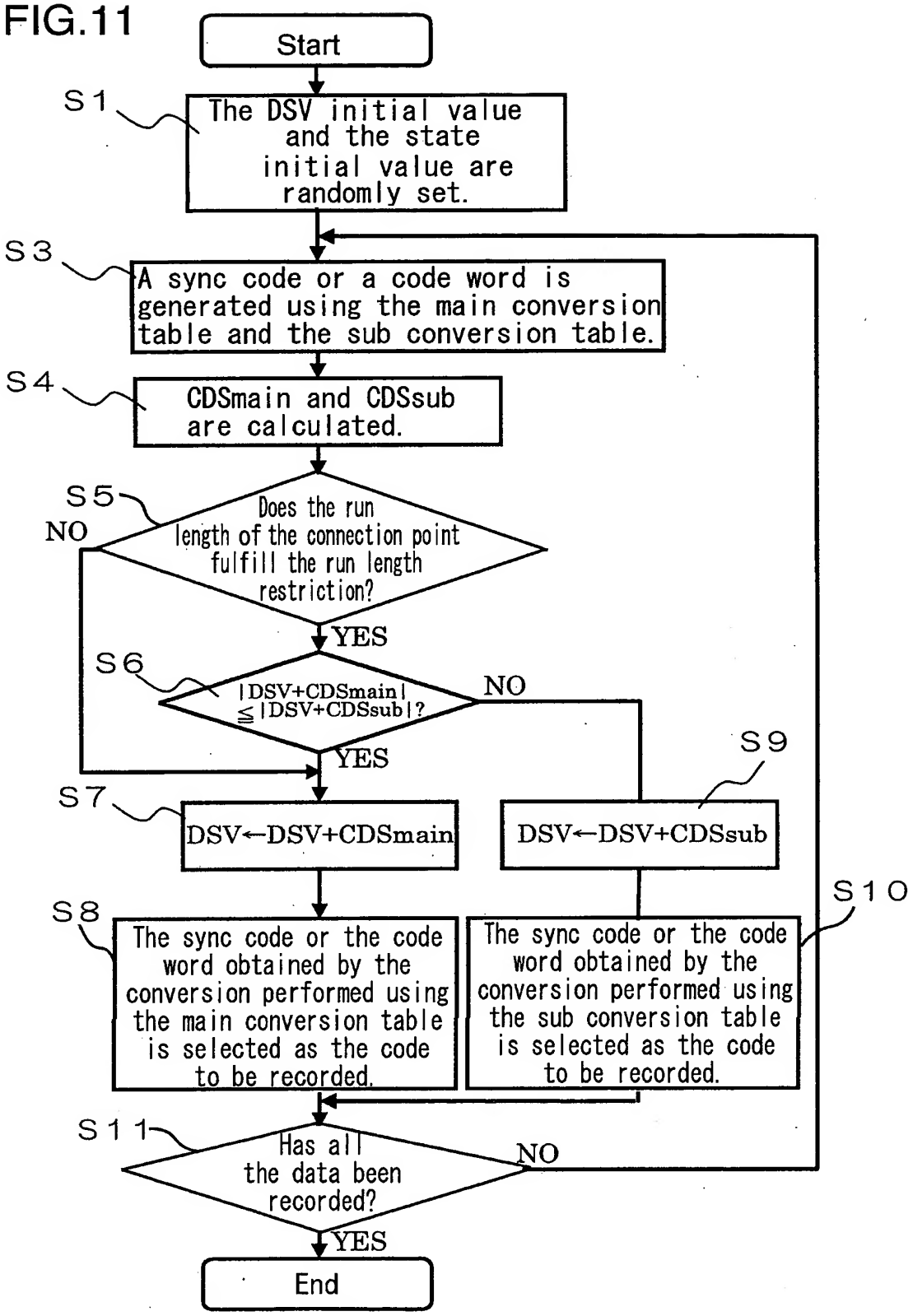

Start
S1
The DSV initial value and the state initial value are randomly set.
S3
A sync code or a code word is generated using the main conversion table and the sub conversion table.
S4
CDSmain and CDSsub are calculated.
S5
Does the run length of the connection point fulfill the run length restriction?
NO
YES
S6
|DSV+CDSmain| ≦ |DSV+CDSsub|?
NO
YES
S9
S7
DSV←DSV+CDSmain
DSV←DSV+CDSsub
S10
S8
The sync code or the code word obtained by the conversion performed using the main conversion table is selected as the code to be recorded.
The sync code or the code word obtained by the conversion performed using the sub conversion table is selected as the code to be recorded.
S11
Has all the data been recorded?
NO
YES
End

FIG.12

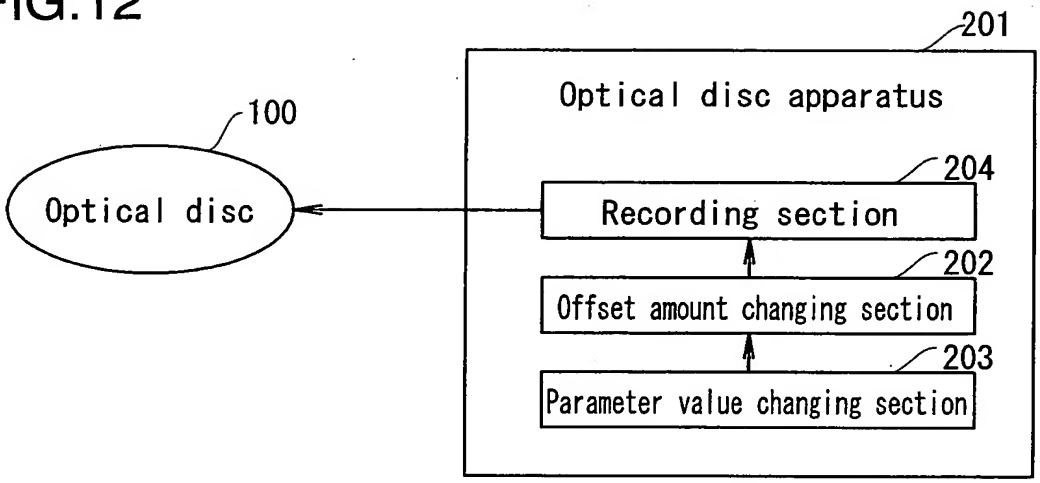

201
Optical disc apparatus
100
Optical disc
204
Recording section
202
Offset amount changing section
203
Parameter value changing section

FIG. 13

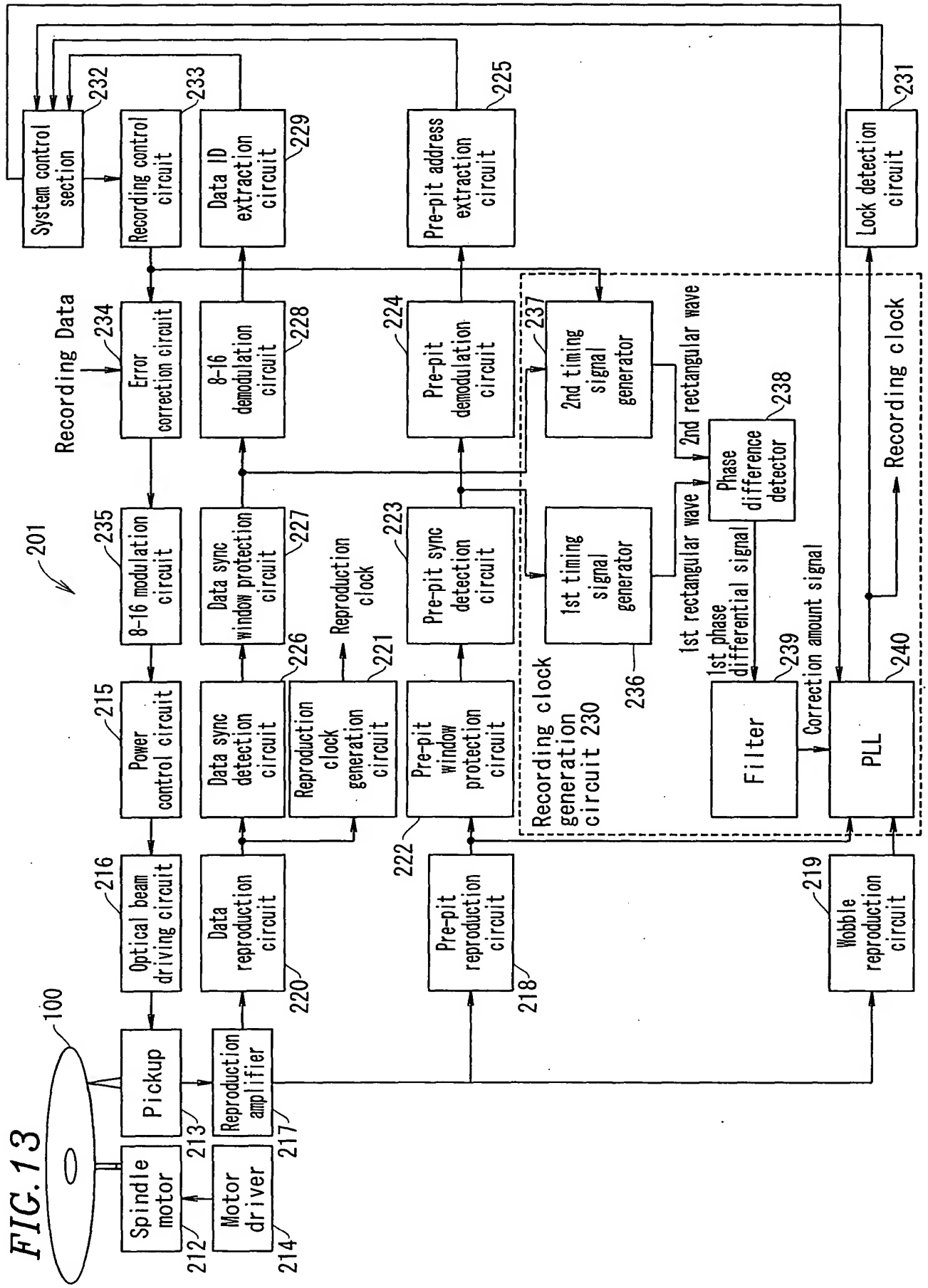
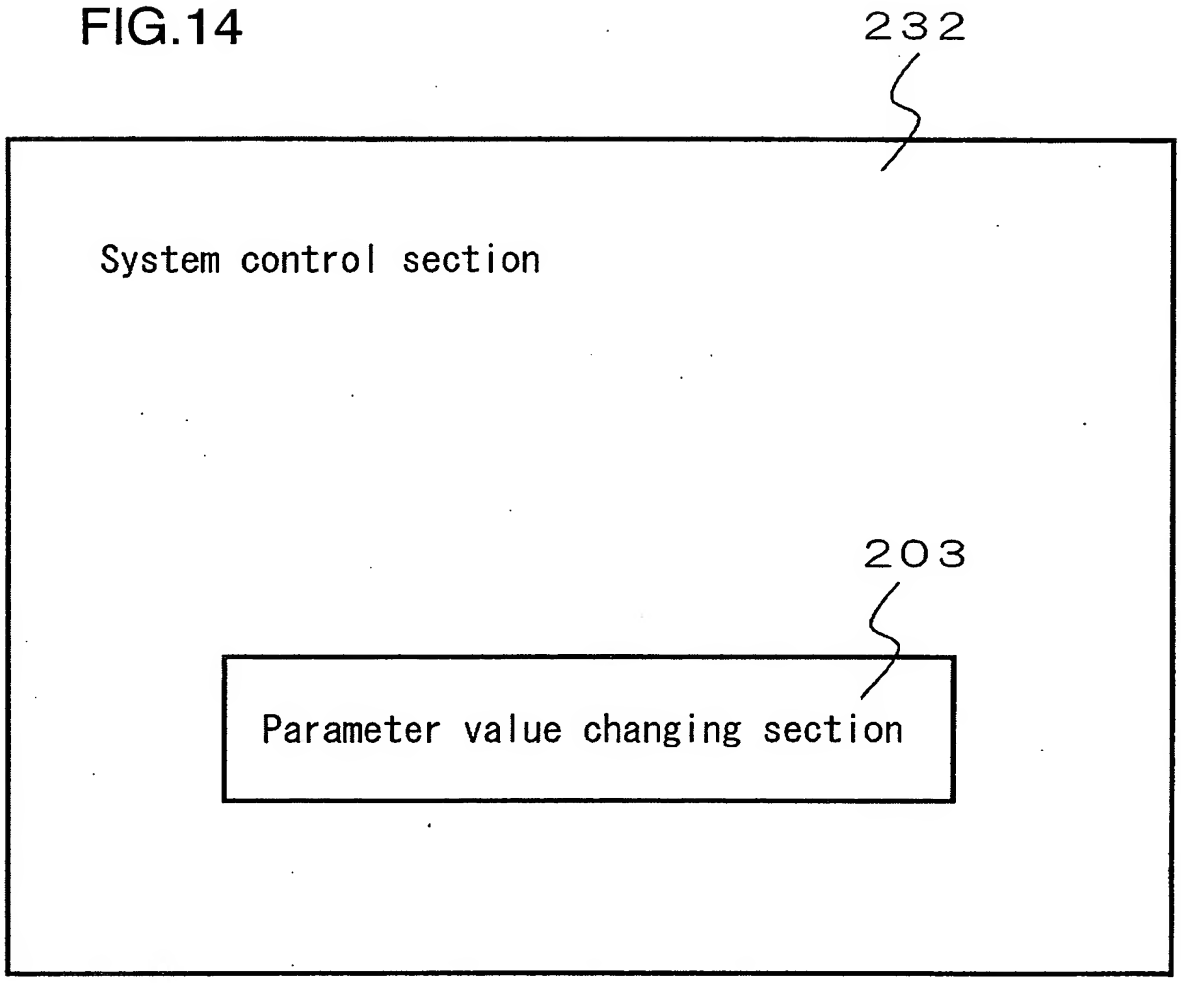

100
Pickup
213
Reproduction amplifier
217
Spindle motor
212
Motor driver
214
Optical beam driving circuit
216
Power control circuit
215
8-16 modulation circuit
235
Error correction circuit
234
Recording Data
201
System control section
232
Recording control circuit
233
Data reproduction circuit
220
Data sync detection circuit
226
Reproduction clock generation circuit
221
Reproduction clock
Data sync window protection circuit
227
8-16 demodulation circuit
228
Data ID extraction circuit
229
Pre-pit reproduction circuit
218
Pre-pit window protection circuit
222
Pre-pit sync detection circuit
223
Pre-pit demodulation circuit
224
Pre-pit address extraction circuit
225
Wobble reproduction circuit
219
PLL
240
Filter
239
Correction amount signal
1st phase differential signal
Phase difference detector
238
1st rectangular wave
2nd rectangular wave
1st timing signal generator
236
2nd timing signal generator
237
Recording clock generation circuit 230
Recording clock
Lock detection circuit
231

FIG.14


232
System control section
203
Parameter value changing section

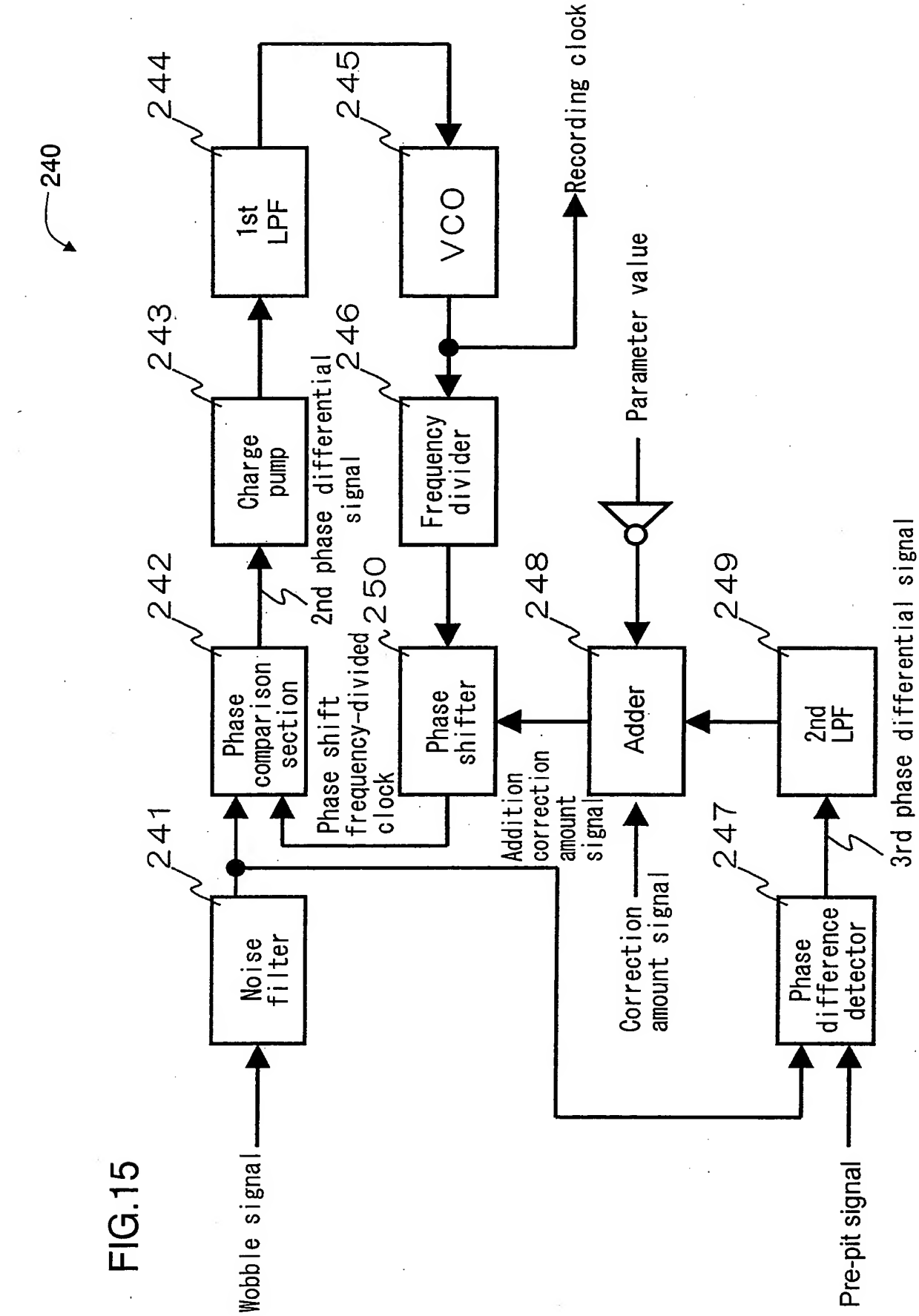

240
241
Noise filter
242
Phase comparison section
243
Charge pump
244
1st LPF
245
VCO
246
Frequency divider
247
Phase difference detector
248
Adder
249
2nd LPF
250
Phase shifter
Wobble signal
Pre-pit signal
Recording clock
Parameter value
2nd phase differential signal
Phase shift frequency-divided clock
Addition correction amount signal
Correction amount signal
3rd phase differential signal

FIG.15

FIG.16

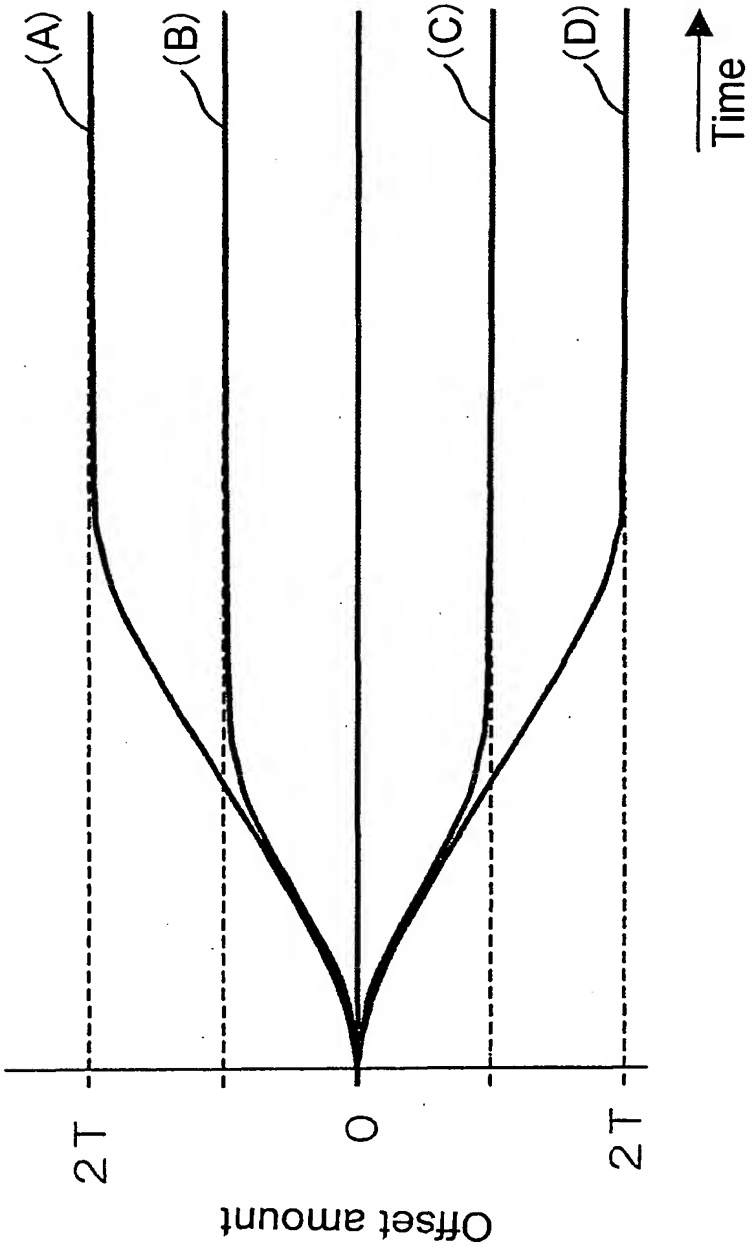


FIG.17A

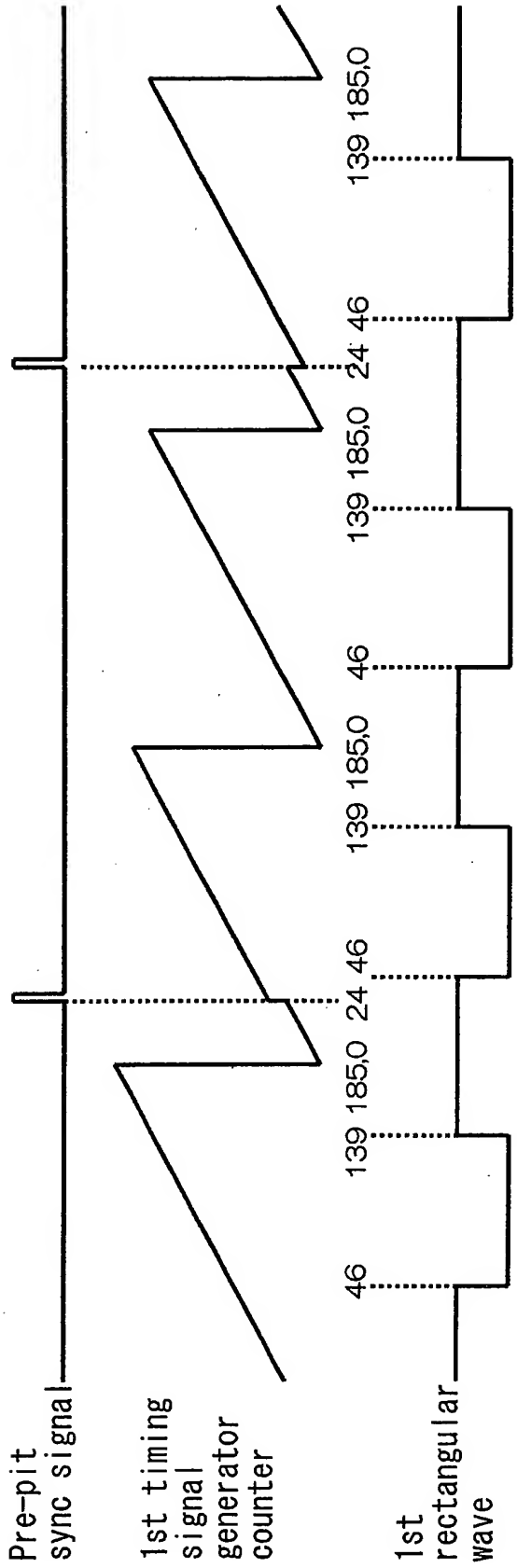

Pre-pit sync signal
1st timing signal generator counter
1st rectangular wave
46
139
185,0
24
46
139
185,0
46
139
185,0
24
46
139
185,0

FIG.17B

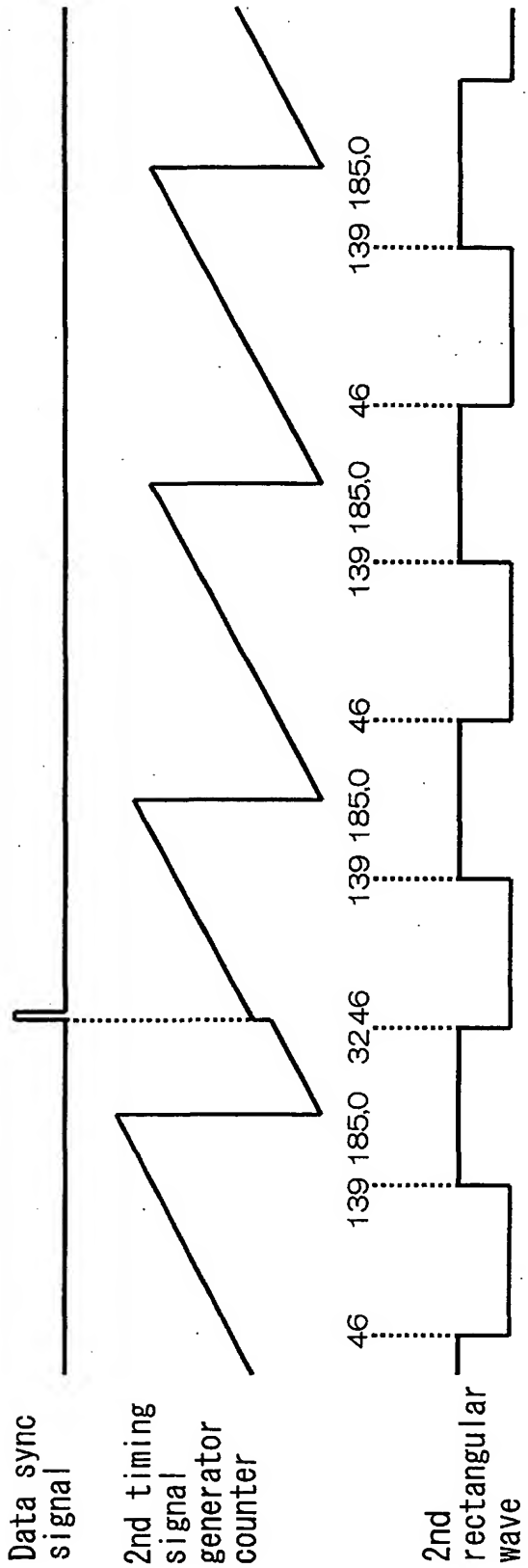
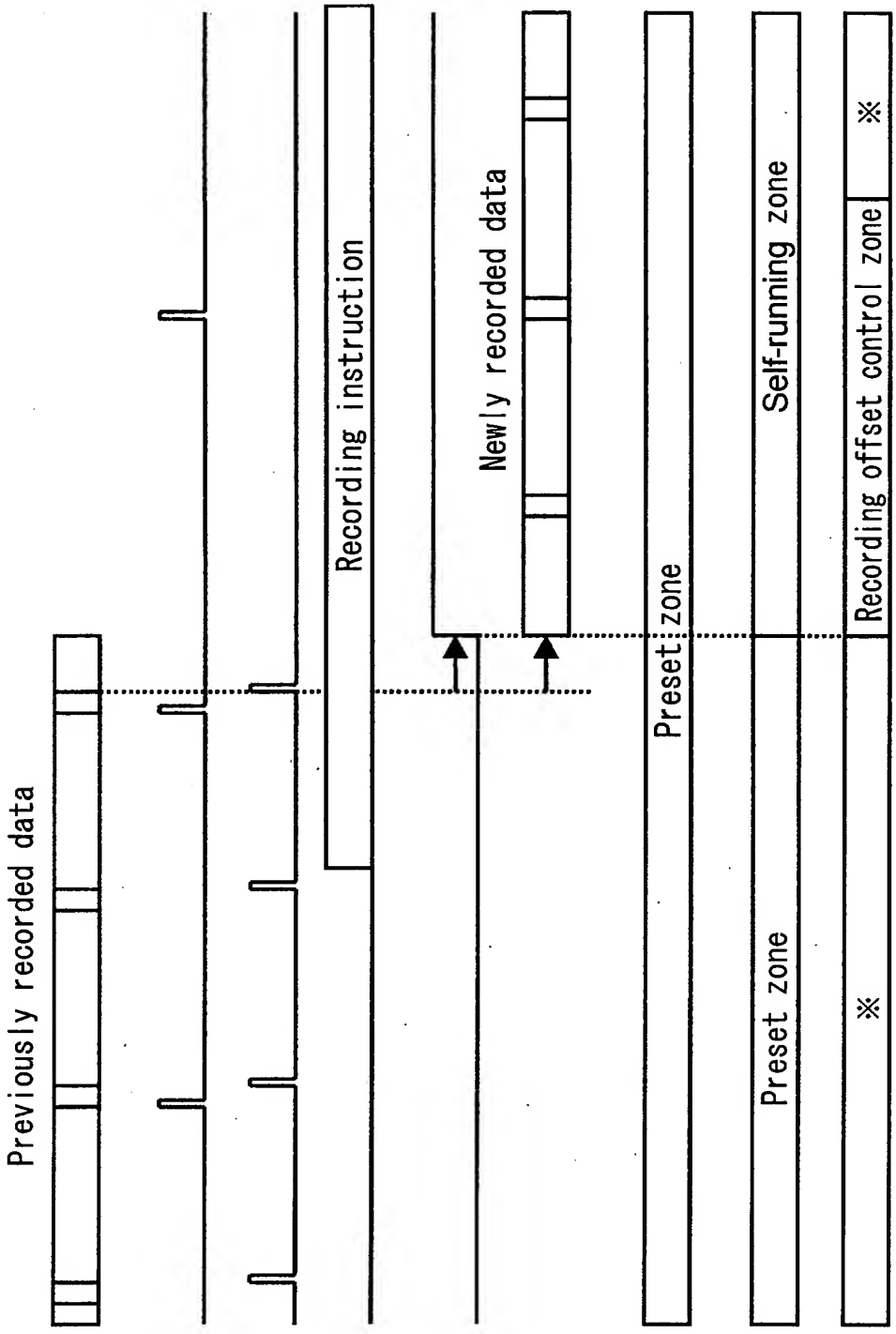

Data sync signal
2nd timing signal generator counter
2nd rectangular wave
46
139
185.0
32.46
139
185.0
46
139
185.0
46
139
185.0
46

FIG.18


Previously recorded data
Pre-pit sync signal
Data sync detection signal (System controller)
Recording instruction
Recording gate signal
Newly recorded data
Recording data
Preset zone
(1st timing signal generator)
Self-running zone
(2nd timing signal generator)
Preset zone
※
(PLL)
Recording offset control zone
※

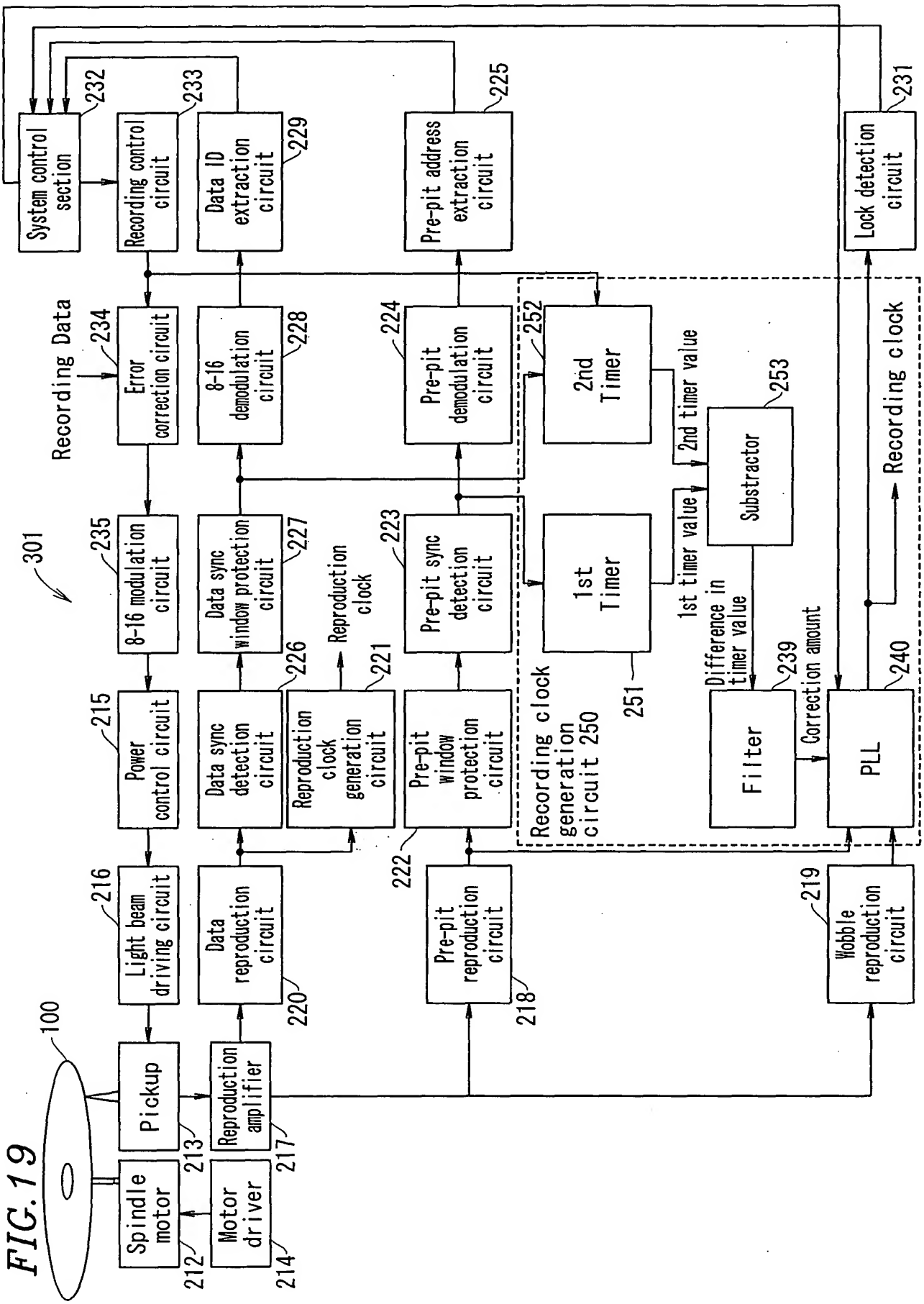

System control section
232
Recording control circuit
233
Data ID extraction circuit
229
Pre-pit address extraction circuit
225
Lock detection circuit
231
Recording Data
Error correction circuit
234
8-16 demodulation circuit
228
Pre-pit demodulation circuit
224
2nd Timer
252
2nd timer value
Substractor
253
Recording clock
301
8-16 modulation circuit
235
Data sync window protection circuit
227
Reproduction clock
Pre-pit sync detection circuit
223
1st Timer
1st timer value
Difference in timer value
Power control circuit
215
Data sync detection circuit
226
Reproduction clock generation circuit
221
Pre-pit window protection circuit
Recording clock generation circuit 250
251
Filter
239
Correction amount
PLL
240
Light beam driving circuit
216
Data reproduction circuit
220
Pre-pit reproduction circuit
222
218
Wobble reproduction circuit
219
100
Pickup
213
Reproduction amplifier
217
Spindle motor
212
Motor driver
214

FIG. 19